

**Unit**  
**6**

# Performing various Plumbing related Operations and Procedures

## **INTRODUCTION**

While carrying out plumbing repairs, it is important that the Plumber has sufficient knowledge of the cause of damage to the plumbing system. Some of the causes that must be kept in mind are listed below.

### **Causes of damage to the pipeline and plumbing system**

1. Defective jointing material
2. Direct strike on the body of the pipe with any sharp edge, while jointing
3. Slipping of jointing material, like rubber ring or lead, etc.
4. Corrosive nature of soil, causing damage to the external surface of the pipe
5. Loss of support or anchorage (horizontal or vertical), both in case of pipes embedded and those laid above the ground level
6. Movement of soil due to filled soil, mining
7. Movement of soil while work such as laying of pipes or cables, etc., is taken up
8. Changes in soil moisture or water table conditions

## NOTES

9. Expansion—severe compression, end crushing
10. Contraction—pull out or separation of joint
11. Pipe blockages and splits
12. Excessive test pressure
13. Pressure surge, water separation, vacuum
14. Extending pipe connections without proper precautions
15. Damage to the internal surface of pipe as well the lining material

The following procedure should be followed for the repair of pipes.

1. Location and demarcation
2. Repair planning
3. Repair work: selection of most appropriate method for repair
4. Testing of ‘dry’ repair
5. Restoration

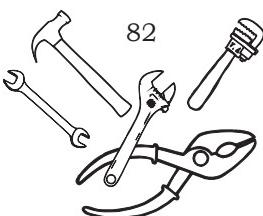
### Steps for repair

1. Inspect the site and ascertain the nature of the failure.
2. Assess any possible damage that may arise and take steps to face such situations.
3. Investigate the access to the site so as to plan the arrangement of plant and equipment.
4. Locate isolating valves for proper control of requisite activities required for repair work

### Types of repair

A ‘wet’ repair is defined as a repair which can be achieved while maintaining a nominal pressure in the pipeline. Split collars or identical fittings can be installed in this way if the conditions are favourable.

A ‘dry’ repair is defined as one in which the main is completely isolated and drained out. It is necessary to stop water supply or make ‘dry’ main while cutting and replacing the defected portion. It will save the water from draining.



## Repair of small, local defects—‘wet repair’

For small local defects such as pinholes, a single split collar or wraparound clamp may be all that is required. The repair can be carried out at as a ‘wet’ or ‘dry’ operation. In case of ‘wet’ repair, care should be taken to maintain a steady, gentle flow so as not to dislodge the sealing elements.

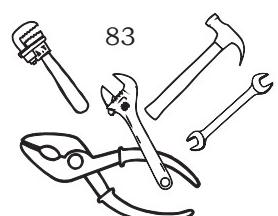
## NOTES

### Cut out—‘dry repair’

For a more extensive damage, for instance, a longitudinal fracture, a section of pipe is cut out and replaced by the use of two appropriate couplers. If the full extent of the fracture is not clearly defined, cuts should be made at least 300 mm beyond each end of the visible crack or defect. In case of any doubt, the full length of the damaged pipe should be replaced. This necessitates cutting out the joint at both ends of the affected pipe. Thus, the repair normally requires two replacement pipe sections and three couplers.

### Replacement repair

1. Carry out correct measurements and give allowance for expansion
2. All cuts should be made clean and square. This means that there must be uniformity in cutting and the cuts must be free from dirt and burr, etc.
3. In AC pipes, cuttings should be avoided.
4. All cut edges should be prepared to the manufacturer’s recommendations.
5. Both exposed ends of the existing pipe should be treated similarly.
6. Couplers should have their sealing rings lubricated, if recommended.
7. Correct expansion gaps should be allowed.
8. Good alignment is essential, particularly if narrow couplers are used.
9. All couplers and collars should be centralised.
10. Tighten all bolts evenly.



## NOTES

11. Do not overtighten bolts or compression joints.
12. Restore any damaged coatings on the parent pipe.
13. Ensure full protection to the bolts and any exposed bare metal before burial.

### Site management

#### Record of repair

While the repair is still visible, the details of repair should be recorded. This could include any leakage that may have been plugged or the change of pipeline, if any.

#### Site cleanliness

During the repair work, the area should be kept as clean as possible. All debris and contaminants should be removed from the site and the contamination of the trench from plant, equipment or any other potentially hazardous materials must be avoided.

#### Prevention of contamination during repair work

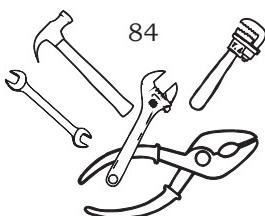
Clean and spray with disinfectant, on all surfaces that come into contact with potable water, including the broken main, repair fittings and replacement pipe. Ensure that the contaminants do not enter the main where it is cut for repair. After completing the repair, flush the main at the nearest hydrant to remove any dirt, etc.

#### Disinfection procedure

For small repairs which do not require the main to be cut, the fracture should be cleaned. This, along with the repair collar should be sprayed with disinfectant. For major repairs requiring cut-out, care must be taken to prevent contamination.

#### Clear site

On completion of the work, all material and protective barriers should be removed from the site and the working area should be left clean and tidy. All records of repair should be completed and submitted.



## **Repair of fixtures**

## **NOTES**

### **Bibcock**

It is commonly referred to as the tap or faucet and it is the most frequently used water supply fitting. There are taps and faucets of many designs available in the market. While repairing, it is also advisable to read the manufacturers' instructions.

The defects commonly encountered in the functioning of taps and faucets, its causes and remedial measures to be taken are listed below.

#### **Defects**

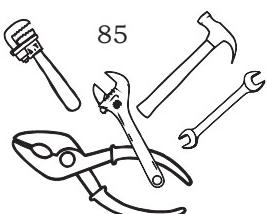
1. Water drips from the tap even when it is tightly closed
2. Water flows from around the spindle or stuffing box
3. Difficulty to turn on or off the tap
4. The spindle slips continuously when the tap is turned on and off.
5. There is a lot of noise in the tap when turned on.

#### **Causes**

1. Worn out or defective washer
2. Accumulation of grit (small, loose particles of stone or sand), dust or other foreign matter
3. Defective seating
4. Gland nut (a component of the tap or faucet) is loose
5. The packing in the stuffing box is defective.
6. The packing in the stuffing box is dry.
7. The spindle is bent.
8. The spindle thread is worn out.

#### **Repair**

1. Close the water supply to the water tap or bibcock.
2. With the help of a vice grip, hold the body of the bibcock.



## NOTES

3. Use the wrench to remove the head of the tap by simply tapping.
4. Check the spindle; if it is worn out, replace it.
5. Remove the old washer of the spindle.
6. Replace with a new washer.
7. Fit the head back to the body.
8. Open the water supply and check the leakage, if any.

### Stopcock (stop tap or stop valve)

It is similar in construction to a bibcock, except that it is placed in the pipeline instead of the outlet. The defects commonly encountered during the functioning of stopcock, its causes and remedial measures to be taken, are listed below.

#### Defects

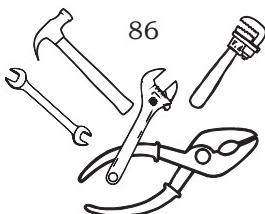
1. Water drips from the stopcock even after it is firmly closed
2. Water flows from around the spindle or stuffing box screw
3. It is difficult to turn on or tune off the stopcock.
4. The spindle slips down continuously when the stopcock is turned and the tap does not close.

#### Causes

1. Worn out or defective washer
2. Accumulation of grit, dust, or other foreign matter
3. Defective stopcock seat.
4. The gland nut is loose.
5. The packing in the stuffing box is defective.
6. The packing in the stuffing box is dry.
7. The spindle is bent.
8. The spindle thread is worn out.

#### Repair of a leaking stop tap joints

First, we have to find exactly where the stop valve or tap is leaking. Mostly, there could be three possible places



where a stop tap may leak.

1. Compression nuts
2. Gland nut
3. Head gear joint



Fig. 6.1: Parts of a stop tap/valve



Fig. 6.2: Opening of a compression nut

**Compression nuts:** If water is leaking from one of the two compression nuts, then tighten the nuts and this should stop the leakage. Grip the body of the tap with water pump pliers and then tighten the nut by turning it clockwise, using a spanner.

If leakage does not stop, then wrap some polytetrafluoroethylene (PTFE) tape (Teflon or plumber's tape) around the nut. Prior to repairing, the water supply should be stopped.

Once this is done, you can loosen the nut by turning it anti-clockwise. Wrap some PTFE tape around the nut and then re-tighten the nut.

**Gland nut:** If the leak is on the gland nut, first try tightening the gland nut with a spanner. This may stop the water from leaking (Fig. 6.3).

The gland nut can be removed and repacked without the water being isolated. It is advisable to use two suitable spanners, one to hold the large nut on the stop tap and one to undo the gland nut. The nut will undo in an anti-clockwise direction.

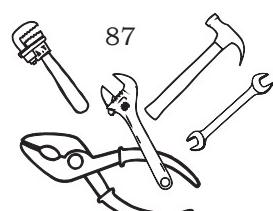
Slide the gland nut up the spindle and then remove any old bits of packing from the gland. If the leak is on the head gear joint, we have to stop the water and then undo the nut and apply some PTFE tape to the threads (Fig. 6.4).

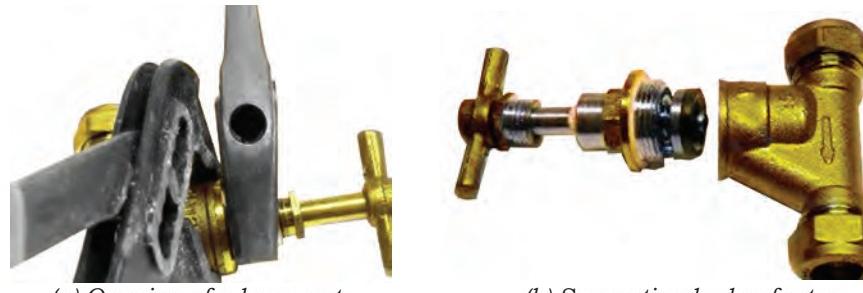


Fig. 6.3: Tightening of a gland nut



Fig. 6.4: Removing bits from a gland nut





(a) Opening of a large nut

(b) Separating body of a tap

Fig. 6.5 (a, b)

### **Replacing stop tap washer**

If water is still leaking through the tap then it is possible that it is worn out or damaged. Replace the washer in the following manner.

1. First stop the water supply to the tap (Fig. 6.5a).
2. Grip the body of the stop tap with a pair of adjustable water pump pliers. Then, with a suitable spanner, turn the large nut in the centre of the stop tap anti-clockwise (Fig. 6.5b).



Fig. 6.6: Checking the washer



Fig. 6.7: Removing the washer



Fig. 6.8: Replacing the rubber washer

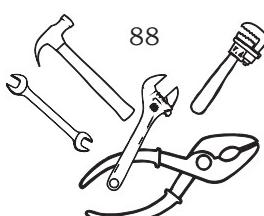


Fig. 6.9: Applying tape



Fig. 6.10: Assembly attached to the stop tap

3. Then, unscrew the handle and assembly from the body of the tap (Fig. 6.6).
4. Now remove the rubber washer at the end of the assembly (Fig. 6.7).
5. Replace the rubber washer with a new one. This simply pushes onto the end of the assembly (Fig. 6.8).
6. Wrap some PTFE tape around the thread of the assembly (Fig. 6.9).
7. Screw the assembly into the body of the stop tap and re-tighten using the water pump pliers and suitable spanner (Fig. 6.10).



## Water supply fitting-gate valve

### NOTES

Gate valve is one of the most common valves used in the main supply lines of a water supply system and pump-lines. The commonly encountered defects during the operation of gate valves, their causes and remedial measures to be taken are listed below.

#### Defects

1. Water flows from around the stuffing box screw
2. The valve is hard to turn on or turn off.
3. The spindle rotates continuously and the gate valve does not close.

#### Causes

1. The gland nut is loose.
2. The packing in the gland nut is defective.
3. The spindle is bent.
4. The spindle thread is worn out.

#### Repair

1. Tighten the dry gland nut.
2. Renew the defective packaging with asbestos hemp and water pump grease.
3. Replace the bent spindle with a fresh one.
4. Replace the worn-out spindle.

## Cistern

#### Repair of cistern

As you know, water is stored in the cistern, and if there is leakage in the cistern, the following steps should be followed for repairing.

1. *Inspect the toilet:* If water is not flushing, it means the flush is defective. It may have broken connection between the flush handle and the flushing mechanism. Remove the cistern lid and carefully set it aside so that it is not at risk of being stepped on by any person. Check all components and find the defective portion.

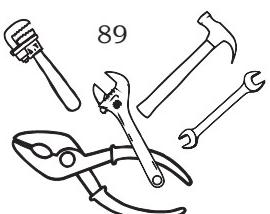




Fig. 6.11 (a, b) Cistern

**2. Repair the handle:** Sometimes, in the toilet cistern, the flush handle is loose and not connected to the other part. It may be due to a worn out connector. Thus, the handle gets dropped. We have to replace the damaged connector. With the help of a wrench, open the nut holding and remove the handle stem from the cistern and replace it with the same specification of handle stem. After undertaking the repair work, test the flush while the lid remains off to make sure it works properly.

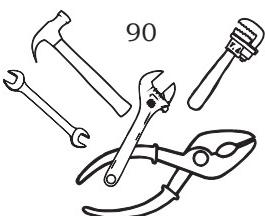
**3. Replace the toilet siphon:** If the toilet cistern flush handle is intact and working properly, the problem is likely to lie with the flush diaphragm which is at the base of the toilet siphon. Toilet siphon is the largest section of the mechanism within the toilet in which water is drawn in and flushed out.

Disconnect the water supply to the toilet and flush out the water until the cistern is empty. Once empty, locate the clips that hold the flush handle to the siphon and the siphon to the rear of the cistern. The entire mechanism can then be lifted out of the cistern and see all components. The entire toilet mechanisms are available in the local market and can be purchased in a kit. Kit consists of all the components needed for replacement. Reassembling the mechanism is simply reversing the procedure used to disassemble it. After reconnecting all the fasteners and components, turn the water supply back on and check the cistern by refilling the water. See if it is working properly.

#### **Repair of float valve**

The float valve is used to stop the level of water in the water tank or cistern of the toilet tank.

1. Open the tank.
2. Check the parts of the float valve.
3. If the floating ball is punctured, replace with a new ball.
4. If the rod of float ball is bent, then straighten it or replace it.
5. Adjust the level of the float ball for water level.
6. Check and test with off and on switch.



## Water closets

Most water closets are made of vitreous china which might crack if exposed to extremely hot water. A plunger will normally handle simple toilet clogs. Another method of cleaning a water closet trap or toilet is the use of an auger with an adjustable, crank-type handle. Known to plumbers as a ‘snake’, the spring steel coil is easily worked past the trap and down the pipe. A three foot auger is inexpensive and will quickly drill through most clogs. Use the auger carefully. Careless handling may crack the toilet.

## Toilet tanks

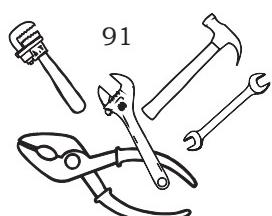
It is a general complaint that water continues to leak into the closet bowl of the toilet tank. It may be due to failure of mechanism of toilet tanks. Let us understand the possible reasons of water leakage.

One, when there is little humming noise or water continues to leak after filling the water tank, it means that there is leakage from the water tank. It may be due to improper placement of the flapper on the water discharge opening. Sometimes, the seat or collar of the discharge opening gets corroded due to sticking of dust, etc. To check the leakage of water, this corroded portion of the collar should be removed by rubbing with a file or scraper. Uniformity of collar will make uniform force on the stopper. Similarly, the wire of the float valve gets bent, leading to leakage of water. This wire should be straightened so that the ball is lifted properly and the water flow is stopped. Float valve should be regularly checked and it must be seen that it does not get shortened or punctured. If so, it should be immediately replaced. To check the overflow, a bent pipe is also inserted in the tank so that overflow of water is seen properly. Overflow pipe is generally kept  $3/4$ " above the desired water level of tank. This will alert the user to check why water is getting lost, and take appropriate action.

## Fittings

You must have observed that taps, faucets and valves are important features of the plumbing system and are used mostly for all purposes. To increase the life of these

## NOTES



## NOTES

fitting, good quality material must be used. Generally chrome-plated brass fittings are mostly used for better quality and long life. These fittings can be easily cleaned with water and soap solutions.

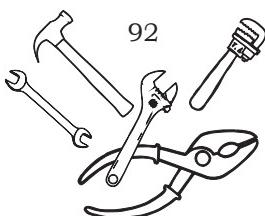
It has been observed that metal chromium gets easily dissolved with the use of hydrochloric acid or sulphuric acid. Muriatic acid is effective for cleaning tiles where nickel-plated fittings are used. For chrome-plated fittings, cleaning of bathroom tiles should be done with oxalic acid. Acid fumes generated during the cleaning process also deteriorate the quality of fittings, despite being covered with clothes. Nowadays, polished brass-based fittings and trim are used mostly due to its better quality.

The use of solvent-based chemical solution should not be promoted for cleaning of tiles and fittings. It is generally suggested that manufacturer's recommendation regarding the maintenance of fittings should be adopted and followed.

### Taps and faucets

#### ***Washerless taps and faucets***

These can be either single handle or the two handle type. In these, the control of water flow is done by a replaceable cartridge or arrangement of seals that allows water flow when the holes or ports are lined up in a proper configuration. Giving the handle an extra hard twist to stop water flow will be ineffective. This type of a tap or faucet does not use compression strength to stop water flow. However, when removing the stem, always check the seat inside the body of the tap and the brass ring that the washer grinds against. The tap or faucet seat can be worn or grooved, making the washer replacement ineffective within days. The washer and seat are the two parts of a compression type tap or faucet that receive the greatest amount of wear. Pad a smooth jawed wrench with a cloth, then, using the padded wrench, unscrew the large packing nut and turn out the tap stem. Then, with a screwdriver that fits the screw slot closely, remove the screw from the bottom of the stem and pry out the worn washer. Next, clean out the washer seat or compartment. When this



is done, insert the new washer of the correct size and composition for hot or cold water. Some of the newer, soft neoprene washers are for both hot and cold water and have a long life. The washer should fit snuggly without having to be forced into position. After inserting, replace the screw and tighten. It is usually just as expensive to renew a seat as it is to buy a new tap, unless it has been made with renewable seat. Check with your plumber about a badly worn tap. With cloth over finger, clean the valve seat inside the tap or faucet. The edge should be smooth and free from deep nicks. If you find it badly worn, you will probably need to replace the seat or have the entire tap or faucet replaced by the plumber. Otherwise, it will leak again. Next, replace the tap or faucet stem and turn it in. Tighten the packing nut. Be careful not to tighten the nut more than necessary to stop seepage around the tap or faucet stem.

## Sink

Sink bowls come in many different materials. Although enamelled cast iron remains an attractive and durable product, many people today are choosing bowls made of stainless steel, and other solid surface materials for their added durability and stain resistance. The important thing to remember is to follow the manufacturer's instructions pertaining to the material of bowl. Use a non-abrasive cleaner. Constant use of abrasive cleaners can eventually wear the finish down, making it much more porous and susceptible to stains. This can also happen with enamelled, cast iron tubs over a long period.

## Washbasin

In our homes, washbasins and kitchen sinks get choked due to some obstruction from waste material or dirt. As a result, water can not flow smoothly. Thus, many small tools like plunger, auger, force cup and wire are used for clearing the obstruction.

## Noises in the plumbing system

In an old plumbing system, different types of noise may be created due to some defect. These could include whistling, chattering or hammering. Whistling is the



Fig. 6.12: Removing clogs in a washbasin

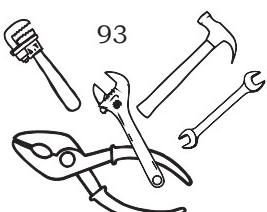




Fig. 6.13: Use of tools for removing clogs

most common noise heard in a plumbing system. It is created when water flows speedily through a pipe of a smaller diameter. It can be eliminated by inserting air pipe in the wall where supply wales enter the plumbing chambers. When water comes in contact with broken, loose pipes or pipes rubbing each other, a chattering noise is created. Due to sudden closing of tap or faucets, a thump in the water pipe is created which makes a hammering noise. These noises can be checked with proper intervention.

### **Odours in the plumbing system**

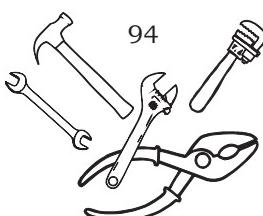
A well-designed and correctly installed plumbing system gives out no odour. Odours are most likely to arise from leaks in the waste or vent piping or from traps which have lost their water seal. In an incorrectly installed system, there is a possibility for odours to result from defects in the system, particularly if the fit is not properly vented.

### **Repair of different types of pipes**

Some of the methods of repair for different types of pipes are given in the following table.

**Table 6.1: Different types of pipes and methods of repair**

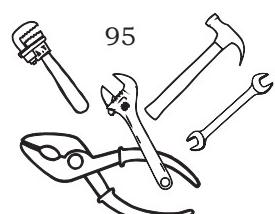
| <b>MATERIAL</b>     |  | <b>CAST IRON</b>   |
|---------------------|--|--|
| <b>Burst</b>        | <b>Action</b>                                    | <b>Repair</b>  |
| Joint failure       | Enclose joint<br>Two couplers                    | Special joint clamp<br>Two couplers and new section                      |
| Brittle failure     | Remove section/joint<br>Enclose failure          | Two couplers and new section<br>Repair collar or clamp                   |
| Corrosion           | Remove section/joint<br>Rehabilitation           | Two couplers and new section<br>Slipping, etc.<br>Repair collar or clamp |
| <b>MATERIAL</b>     |  | <b>DUCTILE IRON</b>  |
| <b>Burst</b>        | <b>Action</b>                                    | <b>Repair</b>  |
| Joint failure       | Enclose joint<br>Remove section/joint            | Special joint clamp<br>Two couplers and new section                      |
| Extensive pinholing | Rehabilitation technique<br>Remove section/joint | Slipping, etc.<br>Two couplers and new section                           |
| Ductile failure     | Remove section/joint<br>Enclose burst            | Two couplers and new section<br>Repair collar or clamp                   |
| Localised pinholing | Enclose burst                                    | Repair collar or clamp   |



| <b>MATERIAL</b>        |   | <b>STEEL</b>   |
|------------------------|---|--|
| <b>Burst</b>           | <b>Action</b>                                     | <b>Repair</b>  |
| Extensive pinholing    | Rehabilitation technique<br>Remove section/joint  | Slip lining etc.<br>Two couplers and new section         |
| Joint failure          | Remove section/joint<br>Enclose joint             | Two couplers and new section<br>Special joint clamp      |
| Isolated pinholing     | Enclose burst                                     | Patch and weld<br>Repair collar or clamp                 |
| Isolated pinholing     | Enclose burst                                     | Patch and weld<br>Repair collar or clamp                 |
| <b>MATERIAL</b>        |   | <b>PRESTRESSED CONCRETE</b>                              |
| <b>Burst</b>           | <b>Action</b>                                     | <b>Repair</b>  |
| Surface softening      | Remove complete length/<br>joint<br>Or cracking   | Two couplers and new pipe section                        |
| Joint failure          | Remove complete length/<br>joint<br>Enclose joint | Two couplers and new pipe section<br>Special joint clamp |
| <b>MATERIAL</b>        |   | <b>POLYTHYLENE/P.V.C</b>                                 |
| <b>Burst</b>           | <b>Action</b>                                     | <b>Repair</b>  |
| Fast crack propagation | Remove damaged section                            | Two couplers and new section                             |
| Brittle failure        | Remove damaged section<br>Enclose burst           | Two couplers and new section<br>Repair collar or clamp   |
| Joint failure          | Cut out joint                                     | Two couplers and new section                             |

## **Plan and schedule routine maintenance, repairs and modifications**

1. As per the manufacturer's recommendation, check the need for repair, or replacement requirement of plumbing items.
2. Read the existing warranties and service agreements made by the user prior to start maintenance or repair work.
3. Prepare the estimate cost of the work to be done and collect a quotation if required.
4. Collect the written approval of the work to be carried out by the concerned person.



## NOTES

5. Detailed information of the site must be collected and check the requirement of access to the site.
6. Identify and select the labour, tools and machinery required for activities.
7. Qualification and skill experience of manpower should be properly checked.
8. Availability of labour should be scheduled as per need.
9. Availability of tools and equipment, machinery should be ensured as per work in advance so that work does not suffer.
10. Prior approval from the concerned department should be taken so that there is no further disturbance during work.
11. Plan appropriate time for installation so that minimum disturbance of operation occurs.
12. Detailed information of weather should be collected so that contingency planning can be done.
13. Mention in detail about the schedules, jobs to be carried out in work order, etc.
14. Submit the bill and final report of execution of work to the customer.

## Practical Exercises

### Activity 1

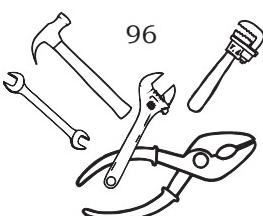
Change of washer in a bibcock

#### Material required

1. Bibcock
2. Washer
3. Screwdriver
4. Spanner
5. Pliers

#### Procedure

1. Select a bibcock.
2. Open its top cover with a screwdriver.
3. Open the nut with the help of a spanner and plier.
4. Take out the spindle.



PLUMBER GENERAL II – CLASS XI

## NOTES

5. Remove the old washer.
6. Replace old washer with a new one.
7. Fix the spindle back and tighten with the help of a spanner and plier.
8. With the help of a screwdriver, tighten the spindle in the body and test it.

### Activity 2

Cleaning the blockage of a washbasin

#### Material required

1. Washbasin
2. Plunger
3. Snake wire

#### Procedure

1. Insert the snake wire in the hole of a washbasin.
2. With the help of a plunger, suck the dirty material.
3. Put water in the washbasin.
4. If water goes out smoothly, it means there is no blockage.

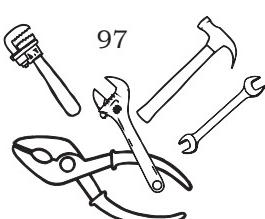
## Check Your Progress

### A. Explain the following

1. Why is repair necessary in the plumbing system?
2. List the defects and its causes in a bibcock
3. What could be the possible defects in a stopcock.
4. What are the reasons for noise in a plumbing system?
5. What are the reasons for odour in a plumbing system?
6. List the causes of damage to the plumbing pipeline.
7. What is the difference between wet repair and dry repair?

### B. Fill in the blanks

1. Water closets are made up of \_\_\_\_\_.
2. The three places where a stop tap may leak are \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
3. Wet repair is done when pressure in the pipe is \_\_\_\_\_.
4. Bibcock is commonly referred to as \_\_\_\_\_.
5. Gate valve is used for \_\_\_\_\_.



## ANSWER KEY

| <b>Unit</b> | <b>Multiple choice questions</b>               | <b>Fill in the blanks</b>  | <b>Full forms</b>  | <b>Match the following</b>           |
|-------------|--|--|--|--------------------------------------|
| 1.          | 1. (a)<br>2. (a)<br>3. (b)<br>4. (a)           | —  | 1. Main Soil Pipe<br>2. Main Ventilating Pipe<br>3. Main Waste Pipe<br>4. Main Soil Waste Pipe | —                                    |
| 2.          | 1. (b)<br>2. (a)<br>3. (b)<br>4. (d)           | 1. Bench vice<br>2. hold, support<br>3. Mason's square<br>4. Drill machine   | —  | 1. (b)<br>2. (d)<br>3. (a)<br>4. (c) |
| 3.          | 1. (d)<br>2. (a)<br>3. (a)<br>4. (c)<br>5. (d) | 1. Stationary<br>2. Noise<br>3. Demolition<br>4. Guards<br>5. potential  | —  | —                                    |
| 4.          | 1. (d)<br>2. (a)<br>3. (a)<br>4. (a)           | 1. 15<br>2. Brass<br>3. Bevelling<br>4. Backflow   | —  | —                                    |
| 5.          | 1. (b)<br>2. (a)<br>3. (b)<br>4. (c)           | 1. Corrosion<br>2. stoppage<br>3. Magnesium<br>4. galvanised, copper   | —  | —                                    |
| 6.          | —  | 1. viterous china<br>2. Compression nuts, gland nuts and head gear joint<br>3. normal<br>4. tap<br>5. controlling the water supply | —  | —                                    |